

Counting particles by mass: the mole · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; current brief acquired; full Chemistry guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Moles · 1.1

Reasoning

The smallest mass of reactant is not necessarily the limiting reagent . The balanced equation compares particle amounts, not grams directly. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Moles · 2.1

Reasoning

The mole measures amount of substance. Use molar mass to convert mass into amount. Balanced equation coefficients give mole ratios; they do not give equal masses. mole: The SI unit of amount of substance; limiting reagent: The reactant that limits the possible product amount.

Moles · 3.1

Reasoning

Calculate the amount available for each reactant and divide by its coefficient. The smaller ratio limits the reaction. Use that reactant to calculate the maximum product before comparing actual yield. Write the balanced equation first, include units in molar masses, then convert each given mass or solution volume into amount. Convert cubic centimetres to cubic decimetres before using concentration in moles per cubic decimetre.

Moles · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: 2.0 g of Mg reacts with excess acid. Use $\text{amount} = \text{mass}/\text{molar mass}$. With molar mass $\text{Mg} = 24.0 \text{ g per mole}$, $\text{amount Mg} = 2.0/24.0 = 0.0833 \text{ mol}$. In $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$, $\text{amount H}_2 = \text{amount Mg} = 0.0833 \text{ mol}$.

Moles · 4.2

Reasoning

Calculate amount in 5.0 g of a substance with molar mass 100 g per mole. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Moles · 5.1

Reasoning

Excess acid means acid does not limit the stated calculation. A coefficient of 2 before HCl does not double the hydrogen amount. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Moles · 5.2

Reasoning

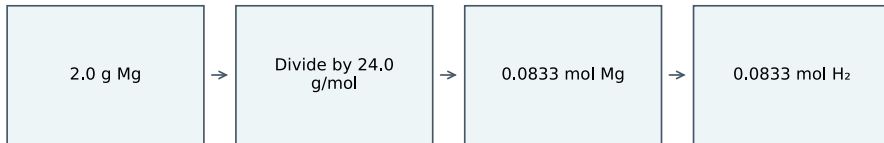
Balanced equation coefficients always give reactant mass ratios. This claim is false:
Excess acid means acid does not limit the stated calculation. A coefficient of 2 before HCl does not double the hydrogen amount.

Moles · 5.3

Reasoning

Amounts, equations and limiting reagents: Calculate the amount available for each reactant and divide by its coefficient. The smaller ratio limits the reaction. Use that reactant to calculate the maximum product before comparing actual yield.

Moles · diagram



- Original teaching diagram: Amounts, equations and limiting reagents
- Use the labels and the stated model together.

Moles · original transfer

Your turn

For $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$, 0.10 mol Mg meets 0.12 mol HCl. Identify the limiting reagent, hydrogen amount and leftover Mg.

Moles · transfer reasoning

Method and interpretation

HCl limits: $0.12/2 = 0.060$ mol reaction. H_2 0.060 mol; Mg left 0.040 mol. Stoichiometric coefficients, not equal starting amounts, determine the limit.

Check yourself

- Explain limiting reagent using the stated model.
- Explain mole using the stated model.
- Change one value in the original transfer; explain which assumption still matters.